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E. altissima revealed a long series of intermediate forms. This suggests that the solitary ovule of *Ephedra* and of *Welwitschia* represents a fusion of "the many ovules and interseminal scales of such a flower as *Cycadeoidea*."

THOMPSON[7] has attacked the problem of the affinities of the Gnetales with the anatomical weapons forged in the study of the conifers and the primitive dicotyledons. In this first paper the genus *Ephedra* is considered, the anatomical features being described in detail. The idea that *Ephedra* may be connected with the Bennettitales or the Cycadales receives no support from the anatomy; on the contrary, the suggestions of relationship to the Coniferales are numerous (arrangement of primary vascular bundles, double leaf trace, arrangement and structure of the tracheid pits, bars of Sanio, tertiary spirals, trabeculae and resin plates, primitive uniseriate lignified rays, wood parenchyma, and endarch leaf bundles). It is further evident that the group could not have arisen from any of the modern conifers, but rather "from or close to the base of the coniferous line." An angiospermous affinity is indicated clearly "by the possession of true vessels, broad rays, formation of broad rays by fusion, and separation of the leaf traces." These general conclusions are abundantly confirmed by the morphological evidence.

Miss BERRIDGE[8] has discovered that a ring of complex groups of vascular strands arises from the bundles in the base of the ovulate "flower" of *Gnetum Gnemon*, and suggests that this may indicate that the ovule was "primitively surrounded by a whorl of male flowers." This would mean that the ovulate strobilus of *Gnetum* was originally bisporangiate.—J. M. C.

Evolution of araucarians.—Probably the most discussed question in connection with the phylogeny of conifers is the relationship of the araucarians to the Abietineae. So far as the historical evidence goes, the two tribes are rivals in age, and the araucarians seem to have been the dominant coniferous vegetation during the Mesozoic. The complete separation of araucarians from Abietineae, by suggesting either their direct origin from the Cordaitales or even from club-mosses, is an idea that has entered into the discussion.

JEFFREY has been a staunch defender of the primitive character of the Abietineae, and of the derivation of the araucarian type from this stock. In a paper just published,[9] he attacks the problem of the evolution of the araucarian type on the basis of a study of abundant material of the existing forms, which is compared critically with the mesozoic material. So far as the evidence of history and anatomy goes, the whole series, from the abietineous stock to the living araucarians, becomes evident. Throughout the investigation it is assumed that the appearance of a character in response to wounding means the recall of an ancestral character.

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[7] THOMPSON, W. P., The anatomy and relationships of the Gnetales. I. The genus *Ephedra*. Ann. Botany **26**:1077–1104. *figs. 2. pls. 94–97.* 1912.

[8] BERRIDGE, EMILY M., The structure of the female strobilus in *Gnetum Gnemon*. Ann. Botany **26**:987–992. *figs. 4.* 1912.

[9] JEFFREY, E. C., The history, comparative anatomy, and evolution of the *Araucarioxylon* type. Proc. Amer. Acad. **48**:531–571. *pls. 7.* 1912.

The combination of characters that makes the araucarian wood unique among living conifers is the close-set and alternating pits of the tracheids, the absence of the bars of Sanio, the usual absence of wood parenchyma, and the much restricted pitting of the ray cells. The wound reactions obtained from living araucarians, combined with the structure and wound reactions of mesozoic forms, lead to the conclusions that the ancestors of the existing araucarians were characterized by the presence of wood parenchyma and by strongly pitted rays. Both of these features are inconsistent with direct derivation from the Cordaitales. The living araucarians have retained in the cone axis, root, and first annual ring of vigorous branches, the characteristic features of the mesozoic forms. It is further shown that the characteristic pitting of the tracheids of *Araucaria* and *Agathis* is not ancestral, but acquired. A very significant result is that obtained from a study of the resin canals, which shows that certain mesozoic araucarians possessed traumatic resin canals; and even in a living *Agathis* normal resin canals were found in certain peripheral regions.

The general conclusion is reached that the araucarians are not derived from the Cordaitales, since their primitive forms possess a number of features that have not been discovered among the Cordaitales. The araucarian type is derived from ancestors with opposite (not alternate) pitting, bars of Sanio, strongly pitted rays, and horizontal and vertical resin canals. This group of ancestral characters selects *Pityoxylon* as the ancestral abietineous type. There seem to be no question that the araucarian and abietineous stocks blend characters in the Mesozoic, and that recognizable araucarians started with numerous abietineous characters that gradually disappeared, until the existing araucarians are very distinct.—J. M. C.

Induction of inheritable changes in plants by ovarial injections.—FIRTH[10], in an apparently preliminary paper, has given the results of experiments, carried on in the hills of India, wherein it was attempted to produce "mutations" by the injections of different salts into the ovaries of plants, and also by the use of external conditions in the medium, and the adding of salts to the soil water. Pure cultures of *Oenothera Lamarckiana, O. tetraptera, O. odorata, Epilobium parviflorum, E. cylindricum,* and *E. hirsutum* had been kept in the garden and grown in "pure pedigreed strains" from 1906 to 1908. These were subjected to different experimental conditions of light relations, temperature relations, soil relations, and the injection of salts into the ovaries. Positive results seem to have been obtained in *E. parviflorum* when watered

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[10] FIRTH, R. H., An elementary inquiry as to the origin of species. Jour. Royal Army Medical Corps **16**:497–504. 1911.